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ABSTRACT

Arguing that technology in education can free teachers to teach, this paper reviews the literature and discusses both the role of the teacher as a facilitator who uses judicious applications of educational technology to ensure that student learning is maximized, and the effects of various factors such as emotional problems and nutritional deficiencies on the degree of learning accomplished. Technological innovations for facilitating or enhancing learning and the role of the teacher are then discussed for each of five progressive stages in the learning process: (1) an information stage, in which research is carried out and data are collected; (2) an exploitation stage, which involves organization, criticism, and processing of data; (3) an assimilation stage, which consists of knowledge fixation; (4) a transfer stage, which consists of application of the acquired knowledge; and (5) an assessment stage in which the quality of learning is evaluated. Ten references are listed. (MES)

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"How can institutions capture the unique and creative talents of its faculty and transmit these to students if not through human interaction? This is the greatest promise of technology - to relieve us of mundane, repetitive tasks so that we will have time to attend to more humane activities." (Anandam, 1986: pp. 70,71)

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There should be full focus upon this "greatest promise of technology" for such educational technology can significantly free teachers to teach. It is through this inspiring interaction between students/teachers that student learning is facilitated. This fact is, unquestionably, educational technology's most powerful justification. And when this fact is recognized and fully accepted, all other considerations regarding the utilization of educational technology, both theoretical and applied, can be constructively considered in furtherance of this primary objective; i.e., to help teachers to teach.

The on-going technological revolution is hardly a new development. More than fifty years ago technological innovations began to create learning options never before available. These alternative schemes for learning continue to accelerate the learning opportunities for each new school-generation of students. And these resources may well continue to challenge future students to achieve even higher levels of learning, for as Toffler (1980) has suggested, the mental powers of people may keep expanding with technologically-based, and supplementary, learning opportunities.

Just what is technology, as it related to the field of education and learning? Hoban (1965) offers the following working definition:

"Technology is not just machines and men. It is a complex, integrated organization of men and machines, of ideas, of procedures, ...and the areas of theoretical development, research, and implementation in education." (p.124)

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Essentially, as competent professional educators agree, ultimately all education is a process of self-education. And as Newsome (1976) notes:

"Educators have learned that they can facilitate the development of a person's mind in particular ways by providing him suitable guidance and by introducing him to a proper environment. Consequently, simply stated, the creation and maintenance of special environments in which students will learn and will want to learn, adapted to the needs and intellectual attributes of a student or students, is generally accepted by society as the special task of professional educators." (p.35)

Additionally, as Weiss (1960) cogently commented:

"Facts, observations, discoveries, as items, are but nutrients on which the tree of knowledge feeds, and not until they have been thoroughly absorbed and assimilated, have they truly enlarged the body of knowledge." (p.1717)

As facilitators, educators can help to insure that the learning which takes place in the student self-education process is maximized. And through the judicious applications of educational technology, whereby the teacher is afforded greater time to teach, potentially greater; i.e., more complete, student learning may be realized.

However, as the author recently pointed out:

"Students' mental/physical conditions as well as overall capacity to learn affect the learning process. Emotional problems, nutritritional deficiencies, and disease can minimize additional learning achieved by investing more time on a learning task." (Blai, 1986:p.39)

Levin (1983) has also noted:

".... there are likely to be important interactions among the various factors determining the amount of learning that takes place. Changing the amount of instructional time overall or for particular subjects will have different effects according to the capacity and effort of students and the instructional resources that are used. Even more important, improvements in situational variables that affect capacity and motivation, as well as in school resources may be better investments than increasing time. And some combination of improvements in all of these factors may yield better returns to schooling investments than focusing only on time."(p.11)

Denham and Lieberman (1980) have proposed that time is a powerful dynamic for increasing learning achievements. Yet, as Levin (1983) has noted:

"there is no evidence that suggests that increasing the amount of time spent in learning is a more effective way to increase achievement relative to the costs than other instructional alternatives. What is done with the time is probably more important in affecting student achievement than mechanical increases in the length of time the school day or school year or class time spent on particular subjects. Results are also likely to be highly dependent on the nature of the student population, the subject, and the organization of instruction." (p.1)

With reference to this specific variable of time as an element affecting the learning process, the writer has suggested that:

"it appears entirely reasonable to conclude,

- 1- increasing instruction/learning time is effectively dependent upon how the time is utilized.
- 2- Mechanical increases in time use may not result in significant academic achievement increases.
- 3- Evidence suggests that instructional time increases may be costly in terms of increments of increased achievement.
- 4- Further empirical evidence indicates that the effect on student achievement may vary substantially among students; settings for instruction/learning affect achievement, as do subjects taught.

One might hope that further empirical inquiry will help determine which techniques, which resources, and which conditions are most appropriate to enhance learning for future students." (Blai, 1986:p.40)

One final caveat regarding effective time utilization in the learning process is succinctly summarized by Levin (1983)

"Efforts to utilize time more productively should be selective and carefully designed to meet specific needs.

....as compelling as the logic and evidence might appear, the consequences of increasing the time allotted to schooling and making its use effective are hardly straightforward or as effective in improving achievement as they have been advertised.

....there is great danger if these types of perceptions are applied in a mechanical fashion without considering other factors." (pp. 1,3)

On the basis of the above discussion, it is concluded that additional research is clearly needed to learn more precisely about the interaction of time and learning achievement. In this connection, the purpose of such educational research should be (Blai, 1970):

"to develop specific findings upon which to base educational decisions. In the final analysis, educational research is nothing more than a means for systematic, empirical observations resulting in the generation of

a limited amount of data or set of facts. In its broadest implications, such research considers the impact of one set of conditions or events upon another. This, in the classically defined 'scientific experiment' consists of changing the 'independent variables' (such as different intensities, amounts, or kinds of things), and then carefully noting the effects on the 'dependent variables' (such as behavior, reactions, or thoughts). " (p.76)

Educational technology has not, nor will it, provide 'miracle cures' for the complex problems in education. It does, however, offer a means for helping to optimize learning results. For example, analysis of the learning process reveals a number of stages or progressive steps in the process. These are:

1- an information stage wherein research is carried out, and the collection takes place of the data to be acquired.

2- an exploitation stage "which involves the marshalling, criticism, and processing of the data that have been gathered." (Dieuzeide, 1976:p.13)

3- an assimilation stage which consists of knowledge fixation.

4- a transfer stage consisting of the application of the acquired knowledge.

5- an assessment stage when evaluations are made as to the extent; i.e., quality of learning that has taken place.

Within each of these stages, various technological innovations for facilitating/enhancing learning can improve the efficiency of the learning acts. Specifically - within stage 1: Information, the use of technology can "facilitate individual information by means of visual or audiovisual data books and documentation and information centers (record libraries, film-slide libraries, etc.)." (Dieuzeide, 1976:p.23) Additionally, technology may further facilitate this acquisition of information through the use of mass communications devices; e.g., slides, films, TV.

Stage 2: Exploitation is typically characterized by group work which involves use of the technological individual response systems which provide a means for the learner to reinforce the correct information (i.e., data) to be learned.

Stage 3: Assimilation, which involves the fixation of the knowledge to be acquired, may be either individual or group work, involving "the use of programmed instruction, teaching machines, and learning laboratories.... joint utilization of programmed material in group work or computer terminals." (Dieuzeide, 1976: p.23)

Stage 4: Transfer, readily employs simulation techniques; e.g., closed-circuit television and teaching machines, in varied applications of the newly acquired knowledge.

Stage 5: Assessment, is facilitated through the use of testing machines and response analyzers, and in terms of tracking the learner's progress through his school years, recording machines and computers may be utilized.

These varied applications of technology specifically to facilitate learning address what Anandom (1986) identifies as "the greatest promise of technology - to relieve us of mundane repetitive tasks so that we will have time to attend to more humane activities." (p.71)

Throughout the above-noted varied learning stages, the role/function of the teacher is equally varied. The appropriate teaching strategy must be carefully selected for each of the varied steps involved. In the Information stage, the teacher's "role is that of guide who prepares the students and supplies the documentation which he has himself prepared or chosen." (Dieuzeide, 1976:p.24)

During the next stage, Exploitation - the teacher's function is to actively serve as a mediator or group leader, encouraging and motivating

interaction among the members of the group. Additionally, he ascertains and corrects misunderstandings, and satisfies himself that the ideas the learners have acquired are correctly understood.

In the assimilation/fixation phase, the teacher's role is diagnostic; i.e., to prescribe actions best suited to the learner's capabilities. And then following, in the transfer phase, his principal function is to be an adviser and guide as the student seeks to apply the new knowledge in appropriate circumstances. In the concluding step, assessment - the teacher insures that the measured evaluations; i.e., the marking system, is fairly/uniformly applied to all of the students-in-learning.

Therefore, in the use of educational technology to facilitate student learning, this will place the teacher:

"in a more central position where pupils can more easily approach him with their individual problems((or, in the words of Anandom (1986)"... we will have time to attend to more humane activities." (p.71))). In this connection, we cannot stress too strongly the fact that the use of educational technology - far from implying any qualitative decline in the role of the teacher - frees him from certain purely mechanical tasks of exposition and repetition, thus enabling him to devote himself to the noble and irreplaceable functions of stimulation of interest, diagnosis, motivation, and advice." (Dieuzeide, 1976; p.24)

Additionally, as Anandom (1986) concludes:

"Technology can challenge, but I am not sure that it can inspire people. Technology can teach logic, but can it formulate our ethics? And technology can expand our minds, but can it cultivate compassion? I guess then, we have to delineate the educational activities that are uniquely nurtured by humans. When we do come up with a list of such activities, they should prompt us to expand our vision, examine our mission, and restructure what we will do and how we will do it. This is technology's greatest premise." (Anandom, 1986; p.71).

One final word, a word of enormous import - budget! A second-rate educational technology budget can only lead to second-rate technology applications. In turn - this simply means second-rate educational 'returns' for the time, talent, and treasure 'invested'.

To evade, or seek to avoid these facts, is tantamount to abandoning full measures of quality in educational offerings. Or - as the folk wisdom would have it - "being penny wise and pound foolish".

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